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Title: Method for Reducing Vibrations and Breakdown of Vertical Centrifuges Used for the Production of Terephthalic Acid

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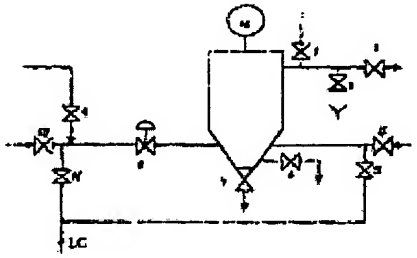
1 Page of Claims, 2 pages of Description and 1 page of Drawings

[54] Title of the Invention: **Method for Reducing Vibrations and Breakdown of Vertical Centrifuges Used for the Production of Terephthalic Acid**

[57] Abstract:

A method for reducing the vibrations and breakdown of vertical centrifuges used for the production of terephthalic acid, comprising the following steps: 1. Installation of an alkali pipe; 2. Separation of the centrifuge and the system; 3. Continuous operation of the centrifuge and oil system; 4. Liquid alkali rinsing; 5. Washing off of alkali solution, followed by restoration of the normal system operation. With the help of the method of this invention, a single treatment cycle requires only 40 minutes, and the testing and repair period of the vertical centrifuge is extended from 1or 2 months to a year.



Claims

1. A method for reducing the vibrations and breakdown of vertical centrifuges used for the production of terephthalic acid, characterized in comprising the following steps:

(1) Installation of an alkali pipe: a liquid alkali introduction pipe is connected to the spray valve (11) of a charging pipe and the spray valve (5) of a pump wash pipe;

(2) Separation of the vertical centrifuge and the system: a steam valve (1), a charging valve (10), a mother liquor valve (2), a discharge valve (7), a pump wash water valve (4), and a sludge water valve are closed; the spray valve (3) of the mother liquor pipe and the spray valve (6) for the discharged material are opened; and pressure is released;

(3) The principal components of the centrifuge and the oil system are continuously operated under normal conditions;

(4) Liquid alkali rinse: hot liquid alkali is introduced through the liquid alkali introduction pipe from the spray valve (11) of the charging pipe and the spray valve (5) of the pump wash pipe, the mother liquor spray valve (3) is opened, discharge of the remaining liquid and lump material is continued, and free circulation of the sprayed liquid is assured, after which the spray valve (3) of the mother liquor pipe is closed, the remaining liquid is discharged through the spray valve (6) for discharged material, the discharge pipe and the bottom pump are washed, and, after washing is completed, introduction of the liquid alkali is stopped; and

(5) Restoration of normal system operation: after the remaining liquid in the system has been completely discharged, the rinse water valve (9) and the pump wash water valve (4) are slightly opened, the water is stopped after

the alkali liquid has been replaced and the system cleaned, the rinse water valve (9) and the pump wash water valve (4) are closed, all the spray valves are closed, the steam valve (1) is opened, and, after the temperature and pressure have risen, normal operation of the system is restored.

2. A method as described in Claim 1, characterized in that the liquid alkali has a concentration of 5% (m/m).

3. A method as described in Claim 1, characterized in that the temperature of the liquid alkali is 70 to 100°C.

SPECIFICATION

Method for Reducing Vibrations and Breakdown of Vertical Centrifuges Used for the Production of Terephthalic Acid

This invention relates to a vertical centrifuge that is part of the equipment used for the production of terephthalic acid (PTA).

PTA, that is, purified terephthalic acid, is an important raw material in the production of chemical fibers, and it is necessary that PTA be of relatively high purity. The quality of the PTA product directly affects the quality of the chemical fiber product. The physical properties of the PTA product and its impurities determine the degree of difficulty of the production operations and the extent to which materials aggregate and cause blockages, which is extremely likely to bring about violent vibrations and to reduce the service life of the vertical centrifuge as a key piece of equipment for removing impurities from the PTA equipment, and thereby affect the separation of components and the introduction of impure terephthalic acid into the product. Once a breakdown of a centrifuge has occurred, the system load must be markedly reduced. After one machine has broken down, the load on the remaining centrifuges is increased. This readily leads to a high degree of vibrations, damage of equipment, a delay in the separation of the impurities in the PTA material, and excessive contamination. Further, it is very difficult to inspect and repair the broken-down machine. The repairs take a long time and have a low success rate, leaving the cause of the vibrations unknown and raising equipment costs. We visited PTA production plants with similar equipment susceptible to such breakdowns, finding that those plants had a similar problem and did not have a good means for handling it. We surveyed the relevant data and found that the only method for dealing with the problem of centrifuge vibrations was washing of the line with water, blowing steam through the pipes, and stopping the rotors of the principal equipment. However, this approach is still incapable of completely solving the problem. After a centrifuge has been operating for a certain period, vibrations gradually increase and there is no method for controlling them. If these vibrations continue for a long time, they inevitably result in damage to the equipment. Short centrifuge operating cycles directly affect the stability and long-term operation of the PTA equipment.

The objective of this invention is to deal with the aforementioned existing problem; to analyze, study, and find the key factors causing a high degree of vibrations; and to find a low-cost, effective method for reducing the vibrations and breakdown of centrifuges used for the production of terephthalic acid that would require little modification of the equipment.

On the basis of analysis and research, it was found that the principal cause of a high degree of vibrations was aggregated material on the walls of the interior of the centrifuge system rotors, the bottom pump, the charging pipe, the discharge port, and the mother liquor pipe, and that this material causes irregular forces to be applied to the centrifuge under high-speed operation, and vibrations to be induced as a result of this.

In view of the above, a technical solution is offered by way of the present invention.

The invention provides a method for reducing the vibrations and breakdown of vertical centrifuges used for the production of terephthalic acid. A dilute alkali NaOH solution (5% m/m) used in the operation of the equipment itself is heated to 70 to 100°C and introduced into the centrifuge system. Taking into consideration the fact that Na^+ can serious affect product quality, before introducing the alkali, it is necessary to separate the centrifuge exhibiting a high degree of vibrations from the system so that pressure is reduced and it is cut off from the system. This assures that a uniform quantity of hot alkali solution can pass through each component of the centrifuge system and that the reaction between PTA and phenyl formic acid is sufficiently promoted at each site. This results in aggregated material being removed from the equipment, and the remaining alkali solution being continually discharged during the washing process. After the sodium terephthalate and the aggregated material on the walls have been washed with the alkali solution, a switch is made to water rinsing, after which the temperature and pressure are raised and system operation is restored. The specific method is as follows:

1. Installation of alkali pipe: the alkali solution is introduced into the pipe from the spray valve of a charging pipe and the spray valve of a pump wash pipe, and the NaOH solution is heated to 70 to 100°C by 5% (m/m) steam heating.

2. Separation of the vertical centrifuge and the system: the steam valve, the charging valve, the mother liquor valve, the discharge valve, the pump wash water valve, and the sludge water valve are closed; the spray valve of the mother liquor pipe and the spray valve for discharged material are opened; and pressure is released.

3. The principal components of the centrifuge and the oil system are continuously operated under normal conditions.

4. Liquid alkali rinse: hot liquid alkali is introduced through the liquid alkali introduction pipe from the spray valve of the charging pipe and the spray valve of the pump wash pipe, the mother liquor spray valve is opened, discharge of the remaining liquid and lump material is continued, and free circulation of the sprayed liquid is assured, after which the spray valve of the mother liquor pipe is closed, the remaining liquid is discharged through the spray valve for discharged material, the discharge pipe and the bottom pump are washed, and, after washing is completed, introduction of the liquid alkali is stopped.

5. Restoration of normal system operation: after the remaining liquid in the system has been completely discharged, the rinse water valve and the pump wash water valve are slightly opened, the water is stopped after the alkali liquid has been replaced and the system cleaned, the rinse water valve (9) and the pump wash water valve (4) are closed, all the spray valves are closed, the steam valve is opened, and, after the temperature and pressure have risen, normal operation of the system is restored.

The method of the present invention has the following advantages:

1. Operation is simple, the alkali used by the equipment is employed, and the principal equipment is not used in the operation.

2. Treatment by this method basically requires no cost, and only 5 tons of dilute alkali is required each time.

3. Only a short time of 40 minutes is necessary for completing the entire process, whereas checking and repairing a single centrifuge requires at least 10 hours.

4. The effect is good and the benefits are visible. A single treatment can extend stable operation for a minimum of 1.5 months. One fewer check and repair (not calculating the cost of inspecting and repairing the equipment) increases PTA production by at least 14.5 tons.

This invention can be used to handle the high degree of vibrations of all Chinese and foreign vertical centrifuges used for the production of PTA, prolong the operating cycle, and increase product quality.

Figure 1 is a schematic diagram of the vertical centrifuge device of this invention.

We shall now describe this invention in specific terms by means of an example.

Example 1. No changes were made in the principal mechanism of a vertical centrifuge used for the production of PTA. The only change was connecting the spray valve (11) of the charging pipe and the spray valve (5) of the pump wash pipe to the alkali introduction pipe. When it was discovered that there was high vibration of the vertical centrifuge and that treatment was necessary, 5% mm NaOH solution was steam heated to 70 to 100°C; the steam valve 1, the charging valve 10, the mother liquor valve 2, the discharge valve 7, the pump wash water valve 4, and the sludge water valve were closed; the spray valve 3 of the mother liquor pipe and the spray valve 6 of the discharged material were opened; and pressure was released. Normal operation of the vertical centrifuge and the oil system was continued, hot liquid alkali was introduced from the spray valve 11 of the charging pipe and the spray valve 5 of the pump wash pipe, the control valve 8 was opened by manual rotation, the flow rate was controlled at 10 to 15 m^3/h, and discharge of the remaining liquid and lump material was continued through the spray valve of the mother liquor pipe, assuring unimpeded spraying of the fluid. After 15 minutes, the spray valve 3 of the mother liquor pipe was closed, the remaining liquid was

discharged via the spray valve 6 for discharged material, and the material was washed out of the tube body and the bottom pump. After 15 minutes, the liquid alkali was stopped.

The remaining liquid in the system was completely discharged, the rinse water valve 9 and the pump wash water valve 4 were opened slightly and the alkali was replaced, the flow of water was stopped, the rinse water valve 9 and the pump wash water valve 4 were closed, and all of the spray valves were closed. The steam introduction valve 1 was opened and the temperature and pressure were raised, after which the system was returned to normal operation.

Applying the method of the present invention to this apparatus allowed treatment to be performed once every 1.5 to 2 months, the centrifuge repair cycle to be extended from the original 1 to 2 months to a maximum of as long as 1 year, and the load on the PTA to be increased. The longer cycle and stable operation solved all major problems. (The processing capacity of a single centrifuge was 15 to 20 tons of PTA per hour.)

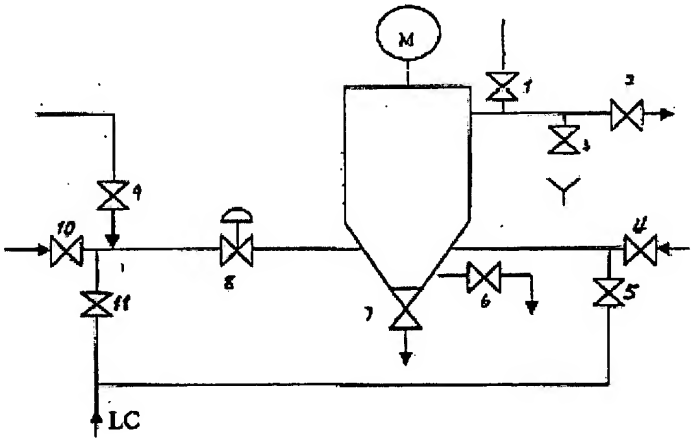


Fig. 1